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Administrivia

- Reminder: Reading assignments will be on the “lecture topics and assignments” Web page. Ideally you will read before class!

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“Object Orientation”?

- A “programming paradigm” — contrast with procedural programming, functional programming, etc.
- No accepted-by-all definition, but most definitions mention encapsulation:
 - Data and functionality grouped together into “objects”.
 - Some data/functionality is hidden.
- Origins in simulation/modeling, where the goal is to model complex systems consisting of many (real-world) objects.

What's An Object?

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- Object — set of data (attributes) and associated functions (methods, behaviors, operations) that can act on data.
- Objects interact by calling each other's methods, or by sending each other messages.
- Often makes sense to have many similar objects — hence "classes".

What's a Class?

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- Can be thought of as a blueprint for objects of a given type; individual objects are "instances" of the class.
- Defines attributes and methods each object will have (instance variables/methods), attributes and methods shared by all objects of a class (class variables/methods).
- Public interface — attributes and methods visible from outside the class.

Java and Object Orientation

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- Java is not purely object-oriented — also includes “primitive types” for efficiency — but it’s much more strongly object-oriented than a hybrid language such as C++.
- Java programs consist of definitions of classes. (No free-standing functions like the ones in C.)
- Java variables (except primitives) are references to objects, classes define types.
- Classes, attributes, methods have varying “visibilities” (from public to private).

Program Structure

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- In Java, everything (variables and code) is part of a class. Typically have only one class per source code file (exception is inner/nested classes — more about them later).
- Any class can have a `main` method that can be launched by the runtime system (more about that later).

Defining a Class

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- Each class is like a blueprint for objects of a particular kind, and can include:
 - Variables — instance (one copy per object) or static (one copy shared by all objects).
 - Methods — similar to C functions, but can be static or non-static (“instance methods”). Instance methods are “invoked on an object”.
 - Classes (more later).
- Variables and methods can be `public` or `private`. Good practice to define as `private`, except for constants that need to be used outside the class.

Naming Conventions

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- Java library classes and methods follow these conventions:
 - If it's mixed-case and starts with uppercase, it's a class.
 - If it's mixed-case and starts with lowercase, it's a variable or method.
 - If it's all uppercase, it's a constant.
- You should follow them too, so your code will be easier for experienced Java programmers to read.

Compiling and Running Programs — Java Versus C/C++

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- With C/C++, your program (“source code”) is transformed by a compiler into . . .
“object code” (different for different processors), which is combined with library object code to produce . . .
an “executable” (different for different operating systems) that can be run like other applications.
- With Java, your program (source code) is transformed by a compiler into . . .
“byte code” (same on any processor), which is executed by . . .
a “Java virtual machine” (which has access to library byte code).

Tools

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- Java programs are text, so you can write them with a text editor and compile and run them from the command line. (In fact I often do.)
- However, many professional programmers use an IDE (Integrated Development Environment), so we will too. For most of the semester we will use Eclipse, which is a free open-source tool written in Java, so you should be able to install a copy on your home machine if you like. (Versions seem to be available for Windows, Linux, and Mac OS X.) But in some ways it's *too* helpful, so we will start using BlueJ.

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Example(s)

- Let's first write the traditional "hello world" program using PAD-I-style tools (`javac` and `java` to compile and execute programs).
- Then let's do it again in BlueJ (`bluej` from the command line if there's no entry in the menus), and also start writing a class for rational numbers.
- (Now you should know enough to start trying examples as you do the reading — and you should!)

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Minute Essay

- Was there anything today that was particularly unclear?
- If you have programmed in Java before, what tool(s) did you use?